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(54) PIPE CONNECTIONS

(71) We, WAVIN. B.V., a Dutch corporate body, of 251 Handellaan, Zwolle, The Netherlands do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to pipe connections.

Electrically conductive surface layers are provided on plastics pipes to prevent the pipes becoming electrostatically charged where sparks caused thereby could give rise to explosions. At connections of such pipes these layers must be electrically interconnected and it is often required that the connections be tensile resistant—that is resistant to tensile forces tending to move the pipe portions connected axially apart.

In order to provide a tensile resistant connection between a socket portion and a spigot portion inserted in a socket end of the socket portion a plastics connecting rod may be introduced from outside the socket portion through an opening therein into aligned circumferential grooves in the spigot portion and socket end, a separate sealing member being provided between the socket end and spigot portion to form a seal therebetween.

The use of separate components for sealing and providing a tensile resistant connection cause assembly of the connection to be relatively time consuming and the introduction of the connecting rod into the grooves therefor can damage the electrically conductive surface layers.

It is an object of this invention to provide a pipe connection in which a single component acts to form a seal and to provide a tensile resistant connection between the socket end and the spigot portion, and in which the danger of damage to the electrically conductive surface layers is reduced.

According to the invention there is provided a pipe connection comprising a plastics pipe socket portion and a plastics pipe spigot portion accommodated in a socket end of the socket portion, an electrically conductive sleeve contacting along its length respective electrically conductive layers on the interior of the socket end and the exterior of the spigot portion to electrically interconnect said layers, said sleeve further forming a seal, and providing a tensile resistant connection between the socket end and the spigot portion.

The invention also includes a plastics pipeline having at least one pipe connection as defined in the last preceding paragraph, which pipeline is connected to a suction apparatus.

In order that the invention may be well understood, an embodiment thereof, which is given by way of example only, will now be described, reference being had to the accompanying drawings, in which:

Figure I a longitudinal section through the pipe connection;

Figure 2 a longitudinal section through a connecting sleeve of the connection shown in Figure 1 to a larger scale than Figure 1;

Figure 3 a longitudinal section through an alternative connecting sleeve: and

Figure 4 schematically shows a pipeline for the extraction of gas by suction from a coal seam.

The pipe connection shown in Figure 1 comprises a pipe socket portion 1 provided with a socket end 3 and a pipe spigot portion 2 accommodated in the socket end 3.

On its outside, the pipe socket portion 1 carries an electrically conductive surface layer 4 which continues along the outside of the socket end 3, extends around the end face 6 of the socket end 3 at 4*a* and proceeds along the inside of the pipe portion 1 and of the socket end 3 at 5 and the pipe portion 1 axially inwardly thereof at 5*a*.

The pipe spigot portion 2 is provided on its outside with an external electrically conductive surface layer 7 and on its inside with an internal electrically conductive surface layer 8 which are connected to one another by an electrically conductive transitional layer 7*a* located at the end face 2*a* of the pipe spigot portion 2.

Between the electrically conductive surface

layer 7 of the pipe spigot portion 2 and the internal electrically conductive surface layer 5 of the socket end 3, there is an electrically conductive sleeve 9.

This sleeve comprises a resilient material, for example rubber, with particles of carbon, such as soot, which act as the electrical conductor.

In order to achieve a tensile resistant connection, which can withstand comparatively high tensile forces, the connecting sleeve 9 is provided on its outer side with three equispaced annular projections 10 projecting therefrom. On its inner side, the sleeve 9 is provided with two annular projections 11 which may be located, as illustrated, symmetrically and axially between each pair of the external annular projections 10, such that the projections 11 are spaced by the same distance as the projections 10.

The projections 10, 11 contact the surface layers 5, 7 at axially spaced locations along the length of the sleeve to electrically interconnect the layers, and to form a seal and a tensile resistant connection between the socket end 3 and the spigot portion 2.

To prevent the pipe spigot portion 2 from being inserted too far into the socket end 3, which could in any case lead to damaging the electrical conductive surface layers 7, 7*a* and/or 5, 5*a*, the sleeve 9 is provided at its inner end with a radially inwardly directed annular flange 14 forming a restriction, the inner diameter of the annular flange 14 being smaller than the outer diameter of the pipe spigot portion 2. Thus, the annular flange 14 will always prevent the pipe spigot portion 2 from being inserted too far. As shown in Figure 2 the inner diameter of the flange 14 is smaller than the inner diameter of the projections 11 in their unstressed condition.

By earthing one of the surface layers 4, 5, 5*a* or 7, electrostatic charges are prevented from accumulating on the surfaces of the pipe portion 1, 2 so that the danger of explosion in the spaces in which such pipe connections are used, is reduced.

In the sleeve 9 illustrated in Figures 1 and 2, the side surfaces or flanks 12 of the annular projections are more steeply angled with respect to the axis of the sleeve 9 than the side surfaces or flanks 13. Moreover, in Figure 2, each of the steeper side surfaces 12 of the inner projections 11 is facing the end of the sleeve provided with the flange 14, whilst the steeper side surfaces of the outer projections 10 are facing towards the opposite end of the sleeve. In this manner, the less steeply angled surfaces 13 of the projections 10, 11 co-operate with the layers 5, 7 and a very good seal associated with an excellent tensile resistance is produced.

The annular projections 10 and 11 have a substantially triangular cross section which as illustrated may form a right angled triangle wherein the more steeply arranged side surfaces form a right angle with the radially inner and outer surfaces of the sleeve 9. Such an arrangement provides especially high tensile strength associated with efficient sealing.

As Figure 3 shows, it is also possible to arrange the projections 10, 11 so that the less steeply angled side surfaces 13 of the inner projections 11 and the steeper side surfaces 12 of the outer projections 10 are facing towards the end of the sleeve provided with the flange 14. In this arrangement it is the more steeply angled surfaces 12 of the projections 10, 11 which co-operate with the layers 5, 7.

The electrically conducting surface layer applied to the plastics pipe portions preferably comprises a layer of modified thermosetting resin provided with carbon particles wherein the layer is applied by spraying or dipping. A composition suitable for this purpose is marketed under the name "Finch 453–1–1 modified epoxy resin" by the Finch Paint & Chemical Division of Bostick GmbH, D–637 Oberursel.

Figure 4 shows a pipeline consisting of a plurality of pipe sections connected to one another in a tensile resistant manner with pipe connections as shown in Figure 1 and arranged in a geological deposit for the removal by suction of methane for the prevention of the danger of explosion and for the winning of valuable methane.

Proceeding from a cross wall 15, a longish bore 17 of 30—40 metres in length is tunnelled into a coal seam 16. Then, a pipeline 18 comprising plastics pipe sections is introduced into the said longish bore 17. This pipeline comprises rigid polyvinyl chloride pipes 1 which are connected to one another by means of tensile resistant pipe connections as shown in Figure 1, and which are coated with an electrically conducting lacquer or resin.

Centering supports 19 are inserted in the bore 17 for supporting the said pipeline 18. The number and position of the arrangement of supports 19 are made to conform to the suction conditions, for example fissures which are to be found in the geological deposit.

The end of the pipe 20 issuing out of the cross wall 15 is connected to a suction apparatus 21 whereupon harmful gases are exhausted from the geological deposit through the pipe end 20. After removal by suction, the suction apparatus 21 is uncoupled and removed. The gas removal suction lines remain in position and are broken up and carried away over their entire length (automatically) by the usual mining machines, together with the coal, as lost fittings or the like. The coal is finally sorted out in the usual manner.

Each pipe section 1 is for example of two metres in length and has a diameter of 50—75 mm depending on the suction conditions, wherein a socket is located at one end. As already explained, the seal provided between

two pipes is electrically conductive, the conductive layer applied to the inside of one spigot pipe end and a conductive layer applied to the outside of the pipe socket and extending on to the inside of the socket, are in electrically conducting connection with one another.

Previously in mining industries, gas suction lines of metal have always been used which are burdened with numerous defects. Thus, due to the presence of the metal suction lines, no electromagnetic measurements can be carried out for determining the structure, the seam thickness and the like the size of the geological deposit and of the surrounding strata. Furthermore, metal suction lines must always be removed from the bores so that they do not come into contact with the mining machines and give rise to sparking producing the danger of explosion.

The removal of the metal suction lines from the bores in the mineral to be mined is not only undesirable from a technical production point of view but furthermore is labour expensive since the metal suction lines are comparatively heavy, however, it is therefore always necessary because on contact of the mineral removing tools of the mining machine with such metal suction lines, the tools can be considerably damaged whereupon long breakdowns occur and in addition replacement parts have to be brought from the surface to the mining location in the underground workings.

With plastics pipes, electromagnetic measurements can now be carried out in the geological deposit without more ado, the danger of damage to the tools of the mining machines is limited to the very minimum and the removal of the gas suction lines can take place in the course of the mining of the minerals.

Having regard to the provision sof Section 9 of the Patents Act, attention is directed to the claims of our Patent Specification No. 1,467,395.

WHAT WE CLAIM IS:—

1. A pipe connection comprising a plastics pipe socket portion and a plastics pipe spigot portion accommodated in a socket end of the socket portion, an electrically conductive sleeve contacting along its length respective electrically conductive layers on the interior of the socket end and the exterior of the spigot portion to electrically interconnect said layers, said sleeve further forming a seal, and providing a tensile resistant connection, between the socket end and the spigot portion.

2. A pipe connection as claimed in claim 1, wherein the sleeve is provided with at least one annular projection projecting from each of its inner and outer sides, which projections contact said layers at axially spaced locations along the length of the sleeve.

3. A pipe connection as claimed in claim 2, wherein each annular projection has a substantially triangular cross-section.

4. A pipe connection as claimed in claim 3, wherein the cross-section of each annular projection forms a right angled triangle.

5. A pipe connection as claimed in claim 2, 3 or 4, wherein each annular projection has side surfaces which extend at different respective angles to the axis of the sleeve.

6. A pipe connection as claimed in claim 5, wherein the less steeply angled side surfaces of the projections cooperate with the electrically conducting surface layers.

7. A pipe connection as claimed in claim 5, wherein the more steeply angled side surfaces of the projections cooperate with the electrically conducting surface layers.

8. A pipe connection as claimed in any one of claims 2 to 7, wherein a said annular projection projecting from the inner side of the sleeve is arranged axially between two said projections projecting from the outer side of the sleeve.

9. A pipe connection as claimed in any one of claims 2 to 8, wherein there are three equi-spaced said projections projecting from the outer side of said sleeve and two said projections projecting from the inner side of said sleeve, the projections projecting from the inner side being spaced by the same distance as the spacing of the projections projecting from the outer side.

10. A pipe connection as claimed in any one of the preceding claims, wherein the sleeve is provided at one end with a radially inwardly directed flange preventing contact between the end of the spigot and the socket.

11. A pipe connection as claimed in any one of the preceding claims, wherein said electrically conductive layers comprise a modified thermosetting resin provided with carbon particles.

12. A pipe connection as claimed in any one of the preceding claims, wherein the pipe socket portion and the pipe spigot portion are formed of polyvinyl chloride.

13. A plastics pipeline having at least one pipe connection as claimed in any one of the preceding claims.

14. A pipeline as claimed in claim 13, wherein the pipeline is located in a pipe tunnel in a coal seam.

15. A pipeline as claimed in claim 14, wherein the pipeline is centered in the pipe tunnel by supports.

16. A pipeline as claimed in claim 13, 14 or 15 connected to a suction apparatus.

17. A pipeline as claimed in claim 13 forming a gas suction line in a bore in a geological deposit for removing gas from the

deposit and adapted to be left in said bore and broken up during the mining of said deposit.

18. A pipe connection substantially as herein described with reference to the accompanying drawings.

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1565530 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

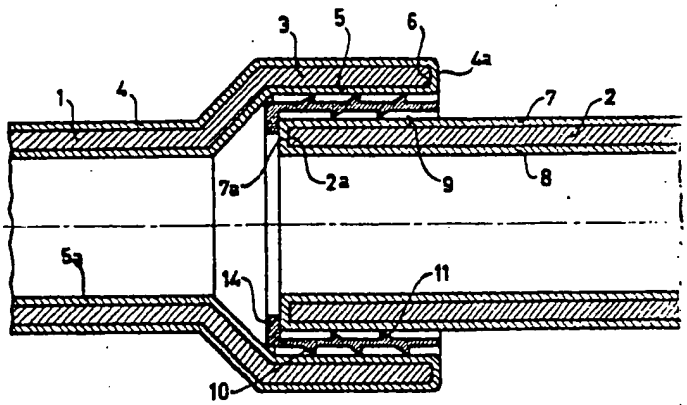

Fig: 1.

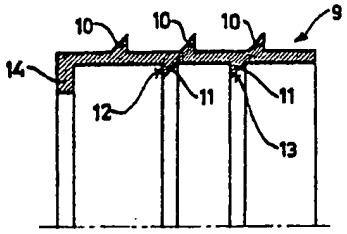

Fig: 2.

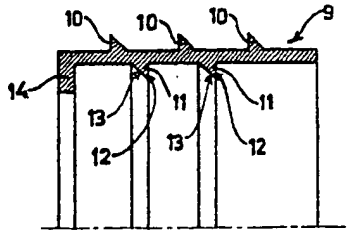

Fig: 3.

1565530 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 2

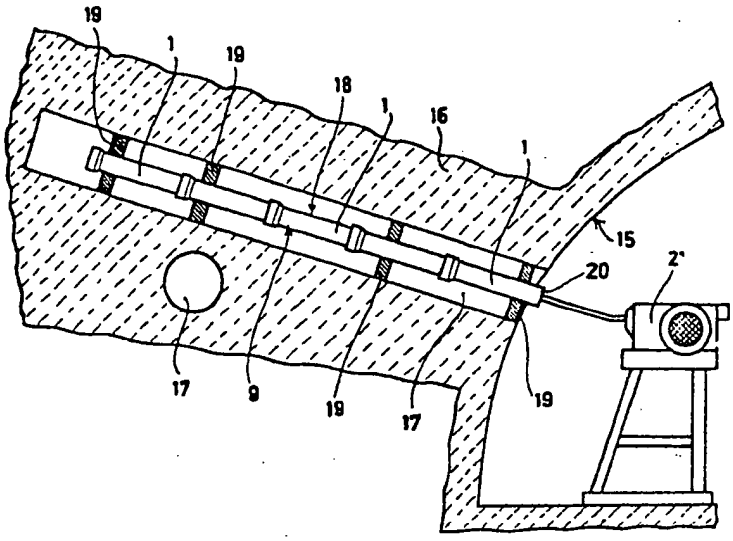

Fig: 4.